ABSTRACT

A fast photon detector with high energy and position resolution, which may be used in the infrared, ultraviolet, EUV, and X-ray ranges includes an absorber, a thermoelectric sensor, a heat sink, all disposed on a dielectric substrate. An absorber receives a photon and transforms the energy of the photon into a change in temperature within the absorber. A thermoelectric sensor is thermally coupled to the absorber. When the absorber receives the photon, the energy of the photon is very quickly transformed into a time dependent temperature difference across the sensor. A heat sink is thermally coupled to the sensor, to maintain the heat flow across the sensor. The absorber, sensor, and heat sink are disposed upon a dielectric substrate, such that the heat transfer from the sensor to the dielectric substrate is much slower than the signal duration.

In another main embodiment, an anisotropic, thin superconducting oxide film is disposed upon a dielectric substrate. The superconducting oxide film in normal state acts as a thermoelectric sensor, and absorbs photons. A large voltage response across the longitudinal direction of the sensor results from the temperature gradient between the top of the sensor and the dielectric substrate, which acts as a heat sink. In this case, the signal duration equals the duration of the heat transfer across the sensor. Optionally, a metallic absorber and an optional insulating layer (or a non-electrically conducting absorber) are disposed upon and thermally coupled to the thin normal state superconducting oxide film to ensure high quantum efficiency of photon absorption.